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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/473,988	12/29/1999	TOSHIKAZU INOUE	991493	1714

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EXAMINER

DOAN, THERESA T

ART UNIT PAPER NUMBER

2814

DATE MAILED: 01/25/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/473,988

Applicant(s)

INOUE ET AL.

Examiner

Theresa T Doan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Status

- 1) ☒ Responsive to communication(s) filed on 28 November 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9, 20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☒ All b) ☐ Some * c) ☐ None of the CERTIFIED copies of the priority documents have been:
1. ☒ received.
2. ☐ received in Application No. (Series Code / Serial Number) _____.
3. ☐ received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

Attachment(s)

- 15) ☐ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 18) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-5, 7-9 and 20 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Shields (U.S. Pat. 5,958,798).

With respect to claims 1, 4-5 and 8, Shields discloses in figure 5 a semiconductor device comprising a semiconductor element 51 formed on a semiconductor substrate, and a multi-layered interconnection structure formed over semiconductor element and electrically connected to the semiconductor element (column 7, lines 36-44),

wherein the multi-layered interconnection structure is an interconnection structure of at least two layers in which a conductive film or a lower interconnection layer and an upper interconnection layer formed on an insulating interlayer are electrically connected through a contact hole formed in the insulating interlayer,

the insulating interlayer 53 formed on a conductive film 51 and including a first insulating layer 52 (top layer) of a composition containing SiH, and shows a HSQ layer with 70% - 90% SiH bonds which is equivalent to an H content of not less than 15.4 atom % in the composition (column 4, lines 60-61), and has been formed to cover the

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conductive film or the lower interconnection layer with a third insulating layer 53 being interposed therebetween.

Although figure 5 does not depict a second insulating layer formed on the first insulating layer, Shields teaches forming additional interconnect multi-layers. Thus, a second insulating layer is formed on the first insulating layer. Therefore, the claimed structure is considered to be at least obvious over Shields's structure.

Although figure 5 of Shields does not depict a second insulating layer having a multi-layer structure made up from layers of the same material, a multilayer structure consisting of layers of the same material are equivalent to a single layer that having composite thickness. Therefore, a second insulating layer having a multi-layer structure made up from layers of the same material that is indistinguishable from a single layer. Thus, Shields's structure is considered to be at least obvious over the claimed structure.

With respect to claims 2, 7 and 9, the claimed limitations of a threshold at which a degassing amount from the insulating layer abruptly decreases upon a slight increase in the SiH content exists in the relation between the SiH content of the first insulating layer and the degassing amount from the first insulating layer,

the first insulating layer has a SiH content not less than the threshold. It is inherent in Shields's device because the claimed structure is identical to Shields's structure.

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With respect to claims 3 and 20, Shields discloses in figure 5 a contact hole having a moderately tapered upper wall surface at the portion corresponding to the second insulating layer. Although figure 5 of Shields does not depict a second insulating layer having a multi-layer structure made up from layers of the same material, a second insulating layer having a multi-layer structure made up from layers of the same material, is indistinguishable from a single layer.

3. Claim 6 is rejected under 35 U.S.C. 103 (a) as being unpatentable over Shields in view of Yu (U.S. Pat. 6,069,383).

Shields teaches substantially the entire claimed structure, as applied to claim 5 above except applying the interconnect structure to a memory cell. Yu teaches a semiconductor element comprises a memory cell having a floating gate 33 formed on a tunnel insulating film 32 on the semiconductor substrate 31, a control gate 35, and a source 39a and a drain 39b formed in surface regions of the semiconductor substrate (figure 3B). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to apply Shields's interconnect structure to a memory cell as taught by Yu, in order to use the interconnect structure in particular application.

Response to Arguments

Applicant's arguments filed 11/28/2001 have been fully considered but they are not persuasive.

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Applicant argues on page 6 that the second insulating layer has a multilayer structure made up from layers of the same material, unlike the single layer and it is possible to prevent line defects from spreading. The argument is not deemed to be persuasive because a multilayer structure consisting of layers of the same material are equivalent to a single layer that having composite thickness and also, in the specification does not explain the function of each layer. Therefore, a second insulating layer having a multi-layer structure made up from layers of the same material that is indistinguishable from a single layer.

The rest of applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Theresa T Doan whose telephone number is (703) 305-2366. The examiner can normally be reached on 8:00AM - 6:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, OLIK CHAUDHURI can be reached on (703) 308-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

TD
January 23, 2002


Douglas Wille
Patent Examiner